ECOLOGICAL ACCOUNT OF A REMNANT COASTAL FOREST NEAR STANFORD, CAPE PROVINCE

By

H. C. Taylor

(*Department of Botany, University of Cape Town*)

(With Plates XXII—XXV)

ABSTRACT

The physical and climatic features of the area are described. A short account is given of the successional communities leading to the formation of forest, and then the two forest communities themselves are described in more detail. It appears that the climax community for this local area is a closed type of forest with an average canopy height of about thirty feet and three species occurring as dominants.

Introduction

This remnant forest, roughly 120 acres in extent, is situated about seven miles south of Stanford, a village between Danger Point and Hermanus in the south-western Cape Province. It differs considerably from the small, scattered forest patches found in kloofs and on screes of the southern slopes of mountain ranges in the rest of the south-western Cape, but shows a resemblance to the coastal forests of the Knysna region further east, and is probably developed from the coastal scrub communities dominated by *Calvaria inermis* which Adamson (1938) mentions as occurring west of the main high forest region at Knysna. The occurrence of a coastal forest of such an advanced type so far west of the forest region is unique; this, together with the fact of its impermanence due to the encroachment of man's activities (Plate XXV, Fig. 2.), led the writer to undertake a rough ecological survey of the area during 1950–1953, in order to record the structure and determine the probable affinities of the forest.

The Habitat

Situation, Extent

The forest is situated just north of a line joining the tiny coastal hamlet of Die Kelders and the equally small inland settlement of Strandskloof to the east. The forest consists of two sections found in folds and depressions on either side of the Baviaansfontein range of hills; westward is the

Short Forest (*Calvaria-Euclea*), about 50 acres in extent (Plate XXII, Fig. 1.), while to the east lies the Tall Forest (*Appodytes-Olinia-Celtis*) with an area of roughly 70 acres (Plate XXIV, Fig. 1). It is in this eastern forest, divided by roads and cultivated lands into three distinct portions, that highest development is attained.

Topography, Geology, Soil

The topography is gently undulating and forest occurs in the broad, sheltered valleys and depressions. Northward the Baviaansfontein hills rise to a height of 1,700 feet but the forest itself lies between 300 and 800 feet above sea level (Plate XXIV. Fig. 2). The Tall Forest is in general somewhat less elevated than Short Forest.

Except for part of the Tall Forest which has a substratum of Younger Cape Granites, the underlying rock formation is Table Mountain Sandstone which is overlain in parts of the Short Forest by a recent thin covering of sandy limestone characteristic of the "strandveld" between Gansbaai and Stanford (Taljaard, 1949). The soil as a rule is therefore sandy and deep, though the Short Forest soil contains some lime and is shallower in parts.

Climate

The climate is equable, *temperatures* seldom exceeding 33 degrees Centigrade in summer or falling below 1 degree Centigrade in winter. Temperature data for the nearest recording centre, Danger Point Lighthouse, show a mean annual temperature of 16 degrees Centigrade, ranging from a mean of 18·9 for the month of January, to 13·3 degrees in July—a range of only 6·6 degrees between means of hottest and coldest months. Similarly the diurnal fluctuations are small, varying from 5·7 to 6·5 degrees difference between mean daily maximum and mean daily minimum temperatures. The meteorological station at Danger Point Lighthouse is situated at the tip of a narrow peninsula jutting about five miles into the sea. Hence the climate at this point will doubtless be more equable, and perhaps more humid, than that at the forest which is about five miles inland from the base of the peninsula.

Precipitation is mainly in the form of rain, the bulk of which falls in late autumn, winter and spring (May to October). Rainfall at Danger Point for the period 1901–1950 averaged 543·8 millimetres per annum, 68% of which fell during the months May to October. Further east the rainfall becomes less seasonal, and in the high forest region of George–Knysna (250 miles eastward) the rainfall is fairly evenly distributed throughout the year.

Sea mists and *low cloud* are not uncommon during late summer, lingering especially in the more sheltered Tall Forest (described later). Humidity at this season is high, especially during the early morning.

Winds during summer are the south-east trades characteristic of this part of the Cape Province. These winds sometimes blow for as long as ten days at a time and are strongest in January; but the south-easters in the region have not the high velocity of those near the Cape Peninsula. Moreover, they contain more moisture, collected during their passage over the ocean, giving rise to the low cloud and mist mentioned above.

The rain-bearing north-west winds of winter are often of great force and violence, though generally of shorter duration than the summer winds. They start blowing in about April and increase in velocity until July–August which coincides with the rainiest time of year. The influence of these cold stormwinds is more severe in the Short Forest on the exposed western side of the hills where a definite wind-moulded physiognomy in the forest is evident, as it tapers off to a wedge of low woody shrubs near the highly exposed coast (Plate XXII, Fig. 1). In contrast to this the Tall Forest, in the lee of the hills, exhibits no wind-moulding yet receives the benefit of a somewhat enhanced rainfall (Plate XXIV, Fig. 1).

THE SUCCESSIONAL COMMUNITIES

In the development of climax forest from the short shrubby "macchia", "sclerophyll" or "fynbos" (as the vegetation typical of the south-western Cape is variously termed) certain stages may be discerned. Some of these are primary in that they occur on more-or-less undisturbed sites; more often, as in the recolonisation of cleared forest, they are secondary.

As a result of such activities as felling, burning and grazing which have been practised on the area for generations the basic successional trends have become obscured; the relationships between communities are therefore even more kaleidoscopic and blurred than is usual in natural vegetation of this kind.

The Tall Sclerophyll: Protea-Leucadendron-Thamnochortus Associes.

In parts of the Stanford area fairly stable fynbos associations (similar to the short sclerophyll of much of the rest of the south-western Cape) are to be found only on very shallow limestone soils where the hardy shrubs of the families Proteaceae, Restionaceae, Ericaceae, Thymeleaeceae, Polygalaceae and Rutaceae seldom exceed two feet in height (Plates XXII, Fig. 1. and XXIII, Fig. 2). On deep sand in sheltered situations, on the other hand, the sclerophyll is unstable, forming a *Protea-Leucadendron-Thamnochortus* associes about ten feet high (varying from five to fifteen feet).

The composition is diverse, containing elements of both previous and later successional stages which demonstrate its unstable nature. Codominants in the associes are three tall, leathery-leaved Proteaceous shrubs, often having a bushy habit, namely *Protea mellifera*, *Protea obtusifolia* and *Leucadendron sabulosum*, together with clumps of the reed *Thamnochortus erectus* (Plate XXIV, Fig. 1). Associated woody plants, all of bushy habit in this community, include *Euclea racemosa*, *Rhus glauca* and *Rhus lucida*, while smaller shrubs like *Mundia spinosa* and *Salvia aurea*—usually found in coastal fynbos—and *Leonotis leonurus*—a typical forest indicator—are often present in more insolated parts. The scandent *Microloma tenuifolia* occurs scrambling over the larger bushes.

The associated woody plants (*Euclea* and *Rhus*) appear where the succession is more advanced, and later also *Pterocelastrus tricuspidatus* and *Cassine* spp. intrude (in bushy form only, and accompanied by more climbers) ousting the Proteaceous element. If protected from fire, Tall Sclerophyll is thus gradually replaced by the Mixed Scrub (described later) and eventually by forest. If burnt, Tall Sclerophyll is generally followed by the Leucadendron Consocies as an intermediate stage before the Mixed Scrub appears. Repeated burning will tend to arrest development in the Leucadendron stage.

The Thamnochortus Reedveld

Both in physiognomy and composition Reedveld is similar to Tall Sclerophyll, the chief difference being the marked single-species dominance in Reedveld of *Thamnochortus erectus* which occurs in tall clumps 6 or 7 feet high and spreading to four feet in diameter. This species is by far the most prevalent and constant member of the community, but due to its open stocking the following associated small woody shrubs fill the intervening spaces between reed-clumps:— *Mundia spinosa*, *Passerina vulgaris*, *Protea mellifera*, *Salvia aurea*, *Stoebe plumosa* and the climber *Asparagus aethiopicus*.

In its position in the succession Reedveld is more variable than Tall Scleroplyll, occurring not only as an early stage in primary succession but also after the clearing of forest or scrub. An instance of the latter is seen near the eastern margin of the Uilkraal Tall Forest (described later) on soil which appears no different in depth and texture from that on which forest is found and where the prevalence of indicators such as *Leonotis leonurus* suggest conditions favourable to forest growth.

Reedveld adjoining the Leucadendron Consocies may, if burnt, be invaded quite rapidly by *Leucadendron* and develop to a closed community of this species. Where protected from fire, Reedveld is invaded gradually from the margins by Mixed Scrub constituents such as *Rhus mucronata*, *Euclea racemosa* and later *Pterocelastrus tricuspidatus*, *Olea capensis* and *Gymnosporia buxifolia*, which shade out the sclerophyll constituents until Mixed Scrub is formed.

This is an interesting community and on account of its flexible nature more detailed analysis might be rewarding.

The Leucadendron Consocies

In contrast to the two above-mentioned communities, the Leucadendron Consocies is a distinct, well-defined seral stage. It colonises deep, sandy soil. The bush layer consists of a dense growth of the single dominant, *Leucadendron sabulosum*, a virgate shrub generally 4 to 8 feet high but reaching 15 feet in favourable localities.

This community shows an abrupt margin; there is little natural spread outside the margin; and no previous developmental stages are apparent: this leads one to suspect that it is a secondary sere brought into being only when the natural vegetation has been fired. Fire opens the cone-like seed-heads of *Leucadendron*, scattering the seeds which flourish in ash on the burnt ground, and which spread to form a virile closed community. This takes place if either Tall Sclerophyll or Reedveld is burnt, particularly the former which contains *Leucadendron*. If the Leucadendron Consocies itself is burnt, it will regenerate even more strongly.

If not burnt it becomes tall (15 feet) and branches densely along almost the full length of the stem, forming a compact crown which casts heavy shade and causes decay of the Leucadendron community itself. The shade, together with the humus provided by fallen leaves, gradually create the mesophytic conditions favourable to the development of Mixed Scrub.

The following species, characteristic of the development of Mixed Scrub, were found regenerating under tall dense Leucadendron:—

Woody bushes:

Calvaria inermis, *Euclea racemosa*, *Myrsine africana*, *Olea capensis*, *Linociera foveolata*, *Pterocelastrus tricuspidatus*, *Rhus mucronata*, *Rhus mucronata* var. *latifolia*.

Climbers:

Antizoma capensis, *Asparagus aethiopicus*, *Solanum quadrangulare*.

Shrubs (in openings):

Polygala myrtifolia.

The ground layer is also reminiscent of the ground layer found under forest conditions, and contains among others the following:

Australina lanceolata, *Lachenalia pendula*, *Oxalis pes-caprae*, *Senecio pinnulatus* and in moist parts *Zantedeschia aethiopica.*

The Mixed Scrub Associes

This is a dense community of the hardier woody shrubs and small trees, all assuming a bushy habit and about 10 feet in height, or 15 to 20 feet where luxuriant. Besides its bushiness the community is characterised by diversity of woody species, lack of single dominance and layering, and absence of a ground layer.

Mixed Scrub is found in the following situations:

(i) as a precursor to Tall Forest, e.g. on the slope south and west of the main Uilkraal Forest;

(ii) as a stage in the regeneration of over-exploited forest, e.g. to the east of Uilkraal Forest and the greater portion of Stanford forest-remnant; and

(iii) as an edaphic sub-climax on the dry northern slopes of limestone outcrops, where the soil is shallow and well-drained, e.g. at Uilenkraal River Poort (Plate XXIII, Figs. 1 & 2).

Typical components of Mixed Scrub are:—

Woody Plants:

Calvaria inermis[1], *Olea capensis*[1], *Linociera foveolata*[1], *Cassine barbara*[2], *Euclea racemosa*[2], *Gymnosporia buxifolia*[2], *Olea africana*[2], *Pterocelastrus tricuspidatus* (bushy form)[2], *Carissa bispinosa*[3], *Gymnosporia lucida*[3], *Rhus lucida*[3], *Chrysanthemoides monilifera*[4], *Osyris compressa*[4], *Rhus glauca*[5], *Rhus mucronata*[5], *Rhus tomentosa*[5].

Climbers:

Cassine tetragona[6], *Antizoma capensis*, *Dolichos gibbosus*, *Solanum quadrangulare*, *Tetragonia fruticosa*, *Vicia sativa.*

Plants found in openings:

Cineraria geifolia[7], *Leonotis leonurus*[8], *Lycium afrum*[8], *Solanum sodomaeum*[8], *Pelargonium lobatum*[9], *Pelargonium vitifolium*[9], *Mundia spinosa*[10], *Passerina vulgaris*[10].

---

1 = tallest plants in highest-develcped areas.
2 = Woody bushes commonly found in scrub.
3 = Found mainly or solely in the limestone sub-climax areas.
4 = Semi-woddy shrubs mainly characteristic of coastal fynbos.
5 = Low woody bushes mainly characteristic of inland fynbos.
6 = Scandent woody shrub in highest developed areas.
7 = Annual.
8 = Shrubs.
9 = Herbs.
10 = Shrubs typical of previous communities.

Under Mixed Scrub, because of the dense shade, a ground layer is absent except in some large openings where a low-growing xerophytic (often succulent) ground flora is found, in contrast to the mesophytic, shade-loving plants found in a corresponding position in forest. In overcut forest regenerating to Mixed Scrub, *Calvaria inermis*, *Gymnosporia buxifolia* and *Euclea racemosa* coppice profusely from stumps, forming a dense thicket which tends to dominate small localised areas.

Of the seventeen woody plants listed above, fourteen are mentioned by Phillips (1931: pp. 139 *et seq.*) as occurring in the scrub communities of the Knysna forest region. The three remaining species (*Cassine barbara*, *Gymnosporia lucida* and *Rhus glauca*) are concentrated in the south-western Cape and rarely, if ever, extend as far east as Knysna.

The Forest Communities

Two forest communities may be recognised: Short Forest and Tall Forest. These differ from the communities previously described in that their upper layer consists of trees with well-marked trunks and distinct crowns. While in intact forest the crowns interlace to form a continuous canopy casting even shade upon the ground, much of the forest here described has a discontinuous canopy caused by excessive exploitation of the tree layer.

Calvaria-Euclea Short Forest

This community, comparable to the "bush" described by Phillips (1931: p. 136) can be transitional between Mixed Scrub and Tall Forest.

In the Stanford area, however, Short Forest is more often found as an edaphic sub-climax of Tall Forest because the substratum of Table Mountain Sandstone is overlain by a thin covering of sandy limestone which makes the soil coarser, shallower and less moist. The Short Forest formed on this soil is of a relatively stable nature and may remain in the sub-climax stage possibly for centuries (Plate XXII, Fig. 1).

Although Short Forest is taller and somewhat more luxuriant than scrub, the form of the trees is more crooked and stunted than in climax forest (Plate XXIII, Fig. 1). General canopy height is about 20 feet though individuals to 30 feet occur, and in the older well-developed parts, especially near streams, characteristic forest conditions have been produced. As a result of this and of leaf litter, soil conditions are somewhat improved, but insufficiently to allow the invasion of climax forest dominants.

This then is the essential difference between Short Forest and Tall Forest: the former contains principally Mixed Scrub species but the population pattern differs from that of Mixed Scrub, and dominance is manifest; whereas Tall Forest is marked by the occurrence of the three mesomorphic forest species *Celtis rhamnifolia*, *Olinia cymosa* and *Apodytes dimidiata*. Of these, only the first named is found rarely in Short Forest; the other two are entirely absent.

Floristically the dominance of *Calvaria inermis* is characteristic of Short Forest. Closely associated is the co-dominant *Euclea racemosa* occurring principally as densely-coppicing, much-branched trees in large openings or near the margins (Plate XXII, Fig. 2), though tall single-stemmed individuals to 30 feet are found within the forest. Subdominant tree species of the Short Forest are *Linociera foveolata*, *Olea capensis*, *O. africana*, *Cassine barbara* and *Gymnosporia buxifolia*.

Marked layering is not found in Short Forest. *Myrsine africana*, which can stand dense shade, is the only low shrub below the canopy, and the ground layer is represented by the following:

Droguetia ambigua *Droguetia thunbergii*	Dominant, very common, forming a carpet.

Stipa dregeana: associated, fairly common.
Knowltonia rigida: in shadiest places.

Openings in Short Forest are frequent due to felling of the trees. Here *Calvaria inermis* is found regenerating by stem coppice (Plate XXV, Fig. 1) and *Euclea racemosa* by root suckers (Plate XXIV, Fig. 2). The following shrubs also occur:

Solanum sodomaeum var. *hermanii:* a stout shrub.
Solanum quadrangulare: a scrambling shrub.
Metalasia muricata: normally characteristic of coastal macchia (Plate XXIII, Fig. 1), while *Droguetia ambigua* and *Nemesia versicolor* form the ground layer. Climbers in Short Forest are represented by:

Antizoma capensis, *Asparagus aethiopicus*, *Asparagus asparagoides*, *Cynanchum obtusifolium*, *Kedrostis nana*, *Melothria punctata*, *Solanum quadrangulare*.

Short Forest is confined to the western side of the Baviaansfontein hills on a gentle slope facing the sea. Its main occurrence is a patch of some 50 acres about two miles from the coastal hamlet of Die Kelders. This lies in a depression of the hills and is quite well developed but a wedge of scrub penetrating nearly to the edge of the coastal dunes within 300 yards of the sea exhibits the wind-moulded physiognomy referred to earlier.

Much of the lower-lying country to the north, for about ten miles along the Kelders—Stanford road, shows signs of previous occupation

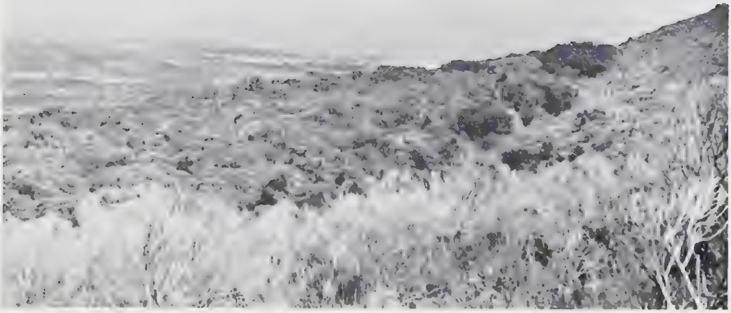

Fig. 1

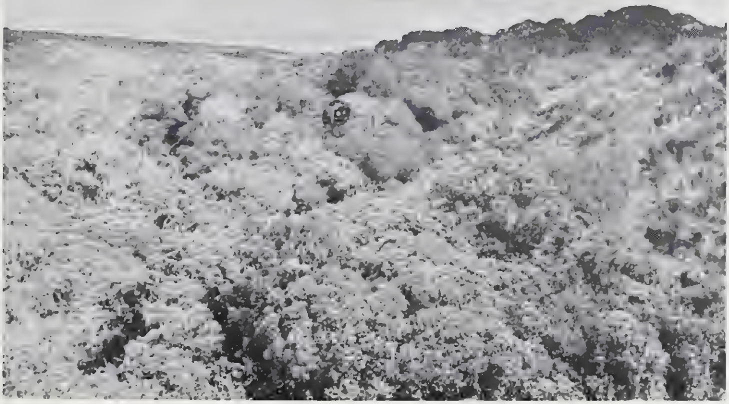

Fig. 2.

Plate XXII, Fig. 1: A general view of Short Forest, showing its situation at the base of a hill and its proximity to the sea (at Kelders). On the right-hand side, the abrupt transition from forest to short sclerophyll of the limestone ridge is clearly marked. In the foreground is a marginal stand of *Metalasia muricata.*

Fig. 2: Detail of Short Forest. The dark-crowned trees on the right-hand ridge are *Calvaria inermis*, the lighter ones in the foreground mainly *Euclea racemosa.*

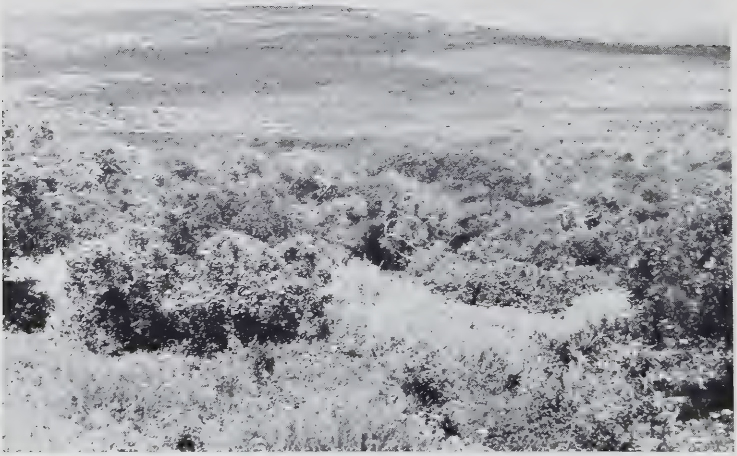

Fig. 1.

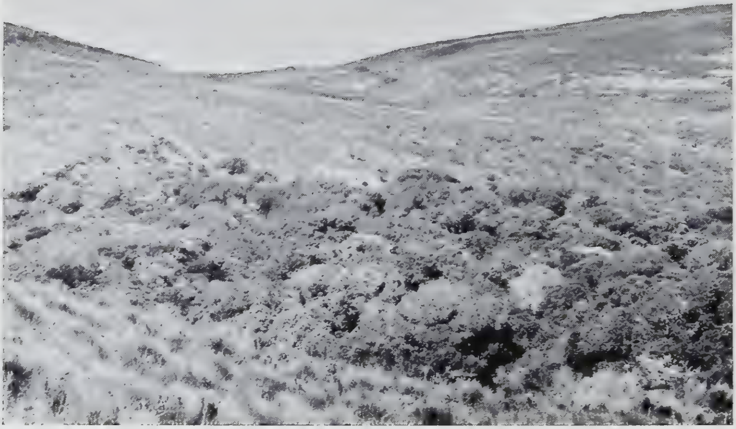

Fig. 2.

Plate XXIII, Fig. 1: The gnarled and stunted nature of the trees of Short Forest is here clearly visible. Those nearest the camera are poor specimens of *Calvaria inermis*, and in the opening between them is a dense (light grey) stand of *Metalasia muricata*. Mixed Scrub in the background.

Fig. 2: An outlying arm of Short Forest in a sheltered depression. Note the white limestone outcrops beyond, with the Mixed Scrub Associes between them and on the hills beyond. In the foreground is short sclerophyll on a limestone ridge.

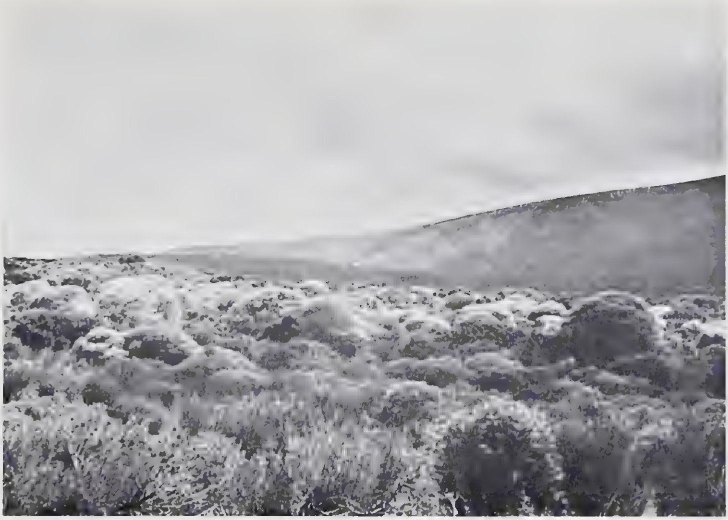

FIG. 1.

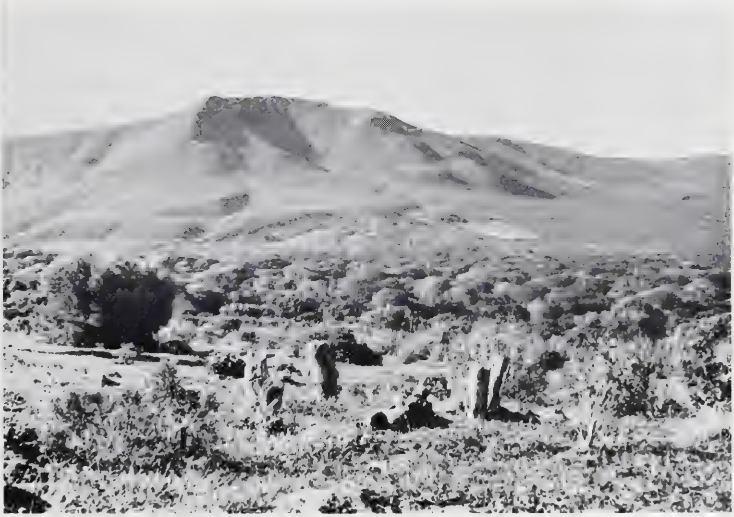

FIG. 2.

PLATE XXIV, FIG. 1: A general view of Tall Forest in the lee of the Baviaansfontein hills. Light-coloured trees with rounded crowns are mainly *Celtis rhamnifolia*, about thirty feet high. Note the park-like appearance. In the foreground, *Thamnochortus erectus* and *leucadendron sabulosum* of the Tall Sclerophyll can be seen.

FIG. 2: The situation of Tall Forest in the lee of the Baviaansfontein hills which rise to about 1,700 feet above sea-level at this point. Forest destruction is taking place in the foreground, with coppice regeneration of Calvaria and Euclea. The large bush on left in middle distance is an alien, *Acacia cyclops*, which rapidly invades disturbed land.

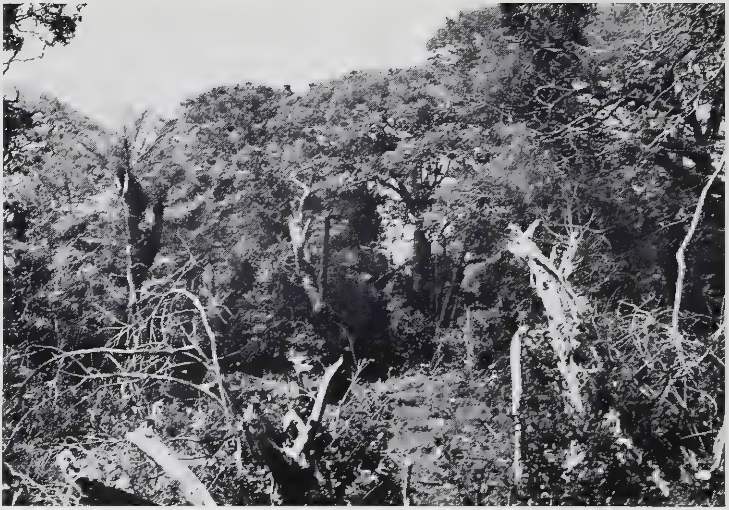

Fig. 1.

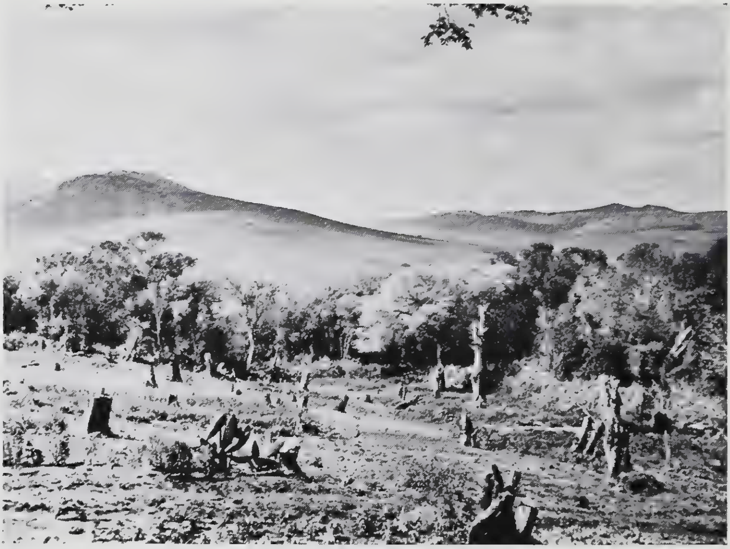

Fig. 2.

Plate XXV, Fig. 1: A near view of the structure of Tall Forest, with shrub layers visible. In the foreground is a clearing where only debris is left after the large trees have been felled; the white flowers are *Zantedeschia aethiopica*, and young coppice shoots of *Calvaria inermis* can be seen.

Fig. 2: This shows where a large area of Tall Forest has been ruthlessly exterminated to make way for cultivation.

by Short Forest but due to the destructive hand of man this has now degenerated to Tall Sclerophyll, Reedveld or Leucadendron, with a few relict patches of Short Forest in favourable areas, particularly near Stanford.

Celtis—Olinia—Apodytes Tall Forest

Climax Association and Dominant Species

The best example of this association is at Uilkraal (*vide* map) where about 70 acres of Tall Forest occur in a well-watered depression to the east of the Baviaansfontein hills. Being east- and south-facing, protected from unfavourable north-westerly winds yet receiving higher summer humidity from the south-easterly mists, and having a deeper, moister soil than Short Forest, this Tall Forest has attained a higher degree of development.

That this is the climax forest vegetation of the region is apparent from its greater canopy height (averaging about 30 feet with individuals to 43 feet) and from its stability of composition in which *Celtis rhamnifolia*, *Olinia cymosa* and *Apodytes dimidiata* occur as dominants. Minor forest species such as *Kiggelaria africana* and *Canthium mundianum* are also more abundant in Tall Forest than in Short Forest. All these species characterise the forest region of Knysna and, beyond, up the coast into Natal.

Layer Communities

The separation of the forest structure into layers is most apparent in the highest developed central part of the forest. In such places four layers can be discerned: the tree layer, tall shrub layer, low shrub layer and a herbaceous ground layer.

Tree Layer

Components of the Tree Layer are as follows:

		Frequency (1—5)
Apodytes dimidiata	Dominant	4
Olinia cymosa		3 +
Celtis rhamnifolia		4 +
Calvaria inermis	Subdominant	4
Canthium mundianum	Associated with dominants	2 +
Canthium mundianum var. pubescens		2 +
Kiggelaria africana		3
Linociera foveolata		4
Olea africana	Mainly associated with subdominant	4 —
Gymnosporia buxifolia		5
Euclea racemosa		5 +

Some parts of the Tall Forest are distinctly park-like in appearance with gracefully spreading *Celtis rhamnifolia* dominants spaced roughly 50 feet apart (Plate XXIV, Fig. 1), the intervening openings being densely grown with lower trees including:

Gymnosporia buxifolia	more xeromorphic
Euclea racemosa	
Canthium mundianum	more mesomorphic
Linociera foveolata	

Even the most highly developed parts of the forest where all three dominants are present, are rather open with a fairly regular spacing of about 25 feet between large trees. Of the three dominants, *Olinia cymosa* appears to be the most constant. The other two show preferences for particular sites, *Celtis rhamnifolia* being found mainly in the north and east, *Apodytes dimidiata* in the west. Of all three dominants the latter species apparently indicates the most mesophytic conditions: the suppression of the xeromorphic *Euclea racemosa* and *Gymnosporia buxifolia* and the appearance of *Canthium mundianum* and *Olea foveolata* (mesophytes) under the shade of *Apodytes*, is a notable feature. The fact that *Royena lucida* in the tall shrub layer is most closely associated with *Apodytes dimidiata* leads one further to conclude that *Apodytes* represents the highest development in Tall Forest.

Past exploitation has caused considerable variation in crown density of this layer, which in turn largely determines the character of the lower layers. As height decreases layering becomes indistinct; if as often happens the tree and tall shrub layers merge, then the remaining two layers are present only sporadically. With heavy over-exploitation this degeneration is carried further to a stage where only a tangled thorny thicket of the most xerophytic species remains, forming a single-layered scrub community with clean floor devoid of ground layer.

Tall Shrub Layer

The presence and composition of this layer depend on the amount of shade cast by the tree layer; direction of sunlight may also be important. In high forest the tall shrub layer, 8 to 10 feet in height, is represented by a single species, *Royena lucida*, occurring singly and thus forming a discontinuous layer. It is found in areas of dense shade, being associated most closely with *Apodytes dimidiata*, the chief dominant.

In less shady areas regeneration of trees—principally *Calvaria inermis*, *Olea foveolata*, *Gymnosporia buxifolia* and *Euclea racemosa*—occur in this layer. The two last-mentioned, which prefer more light, are predominant in openings receiving northerly and easterly sunshine.

Cassine tetragona, a scandent shrub 6 to 10 feet high, is also found in the Tall Shrub Layer.

Low Shrub Layer

Like the previous layer, the Low Shrub Layer typical of high forest is dominated by a single species, *Myrsine africana.* This shrub, 2 to 4 feet high, is abundant and evenly spread under the denser shade of forest trees and of the Tall Shrub Layer.

In more open localities the sclerophyll shrubs *Solanum sodomaeum, Podalyria myrtifolia* and *Rhus tomentosa* intrude to form a low shrub layer within the forest, while *Salvia aurea* and *Leonotus leonurus*—often found in Reedveld—occur also in degenerate forest.

Ground Layer

Here again light has an important influence on composition. In addition, because many of its components are annuals, the character and height of this layer vary with the seasons. Most complete ground coverage is found during the winter and spring growing seasons when general height is about 12 inches.

In high-forest shade the nettle *Australina lanceolata* is dominant; *Oxalis pes-caprae* and *Ehrharta erecta* are associated with it, all three covering the ground like a carpet. Scattered among these are the geophytes *Lachenalia pendula, Melasphaerula ramosa* and *Zantedeschia aethiopica* (Plate XXV, Fig. 1).

Where growth of the above is excluded by heavy shade, for example under dense scrub, the ground layer is absent except for patches of the geophyte *Chasmanthe aethiopica.* On slightly more open sites the taller herb *Senecio pinnulatus* occurs in pure stands. As openings increase in size, such as towards the margins or where large trees have recently been felled, the number of species in the ground layer also increases. Being mainly annual herbs (the families Umbelliferae, Scrophulariaceae and Compositae predominant) these plants often occur in small pure clans or societies but though the ground coverage is nearly complete during the growing season there is no general dominance. Main components, varying from 6 to 24 inches in height, are:

Caucalis africana, Cenia sericea, Cerastium capense, Droguetia ambigua, Erodium malachoides, Hemimeris sabulosa, Nemesia versicolor, Senecio burchellii.

Larger openings contain the following:

Conium maculatum (with succulent stem, to 6 feet)
Adenogramma glomerata (spreading and slender, semi-succulent).

Dorotheanthus muirii (creeping succulent); from which it would seem that xerophytism in the form of succulence is a character of the plants in large openings receiving full sunlight during the middle of the day.

Climbers

The climbers in Tall Forest include most of those named earlier together with one or two not yet mentioned.

Kedrostis nana, *Cynanchum obtusifolium*, *Melothria punctata* and *Phaecocapnos cracca* are found mainly under mesophytic, shady conditions. In situations where some light can penetrate, as on moribund trees with thin crowns or on trees adjoining openings made by felling, a tangle of many species occurs, among which are *Asparagus asparagoides* and *Secamone alpini.* Drier areas within the forest may be colonised by *Antizoma capensis*, *Asparagus aethiopicus* and *Zehneria velutina;* these are also common along the forest margin or in Mixed Scrub. *Cassine tetragona*, a scandent shrub, appears in the Low Shrub Layer of the forest.

ACKNOWLEDGEMENTS

Professor C. L. Wicht (Institute for Forestry, University of Stellenbosch) and Dr. K. H. Schütte (Department of Botany, University of Cape Town) gave useful comment and advice in the field, while Professor A. W. Bayer (Department of Botany, University of Natal) has been most painstaking and constructive in his criticism of the draft. The many plant specimens were named by the herbaria of the South African Museum, and the National Botanic Gardens, Kirstenbosch.

I am sincerely grateful to all these for their aid.

References

Adamson, R. S. 1938. "The Vegetation of South Africa". British Empire Vegetation Committee, London.

Phillips, J. F. V. 1931. "Forest-Succession and Ecology in the Knysna Region". Government Printer, Pretoria.

Taljaard, M. S. 1949. "A Glimpse of South Africa". University Publishers and Booksellers, Stellenbosch.

Tansley, A. G., and Chipp, T. F. 1936. "Aims and Methods in the Study of Vegetation". British Empire Vegetation Committee, London.

"The Climate of South Africa", Parts I and II. Government Printer, Pretoria.

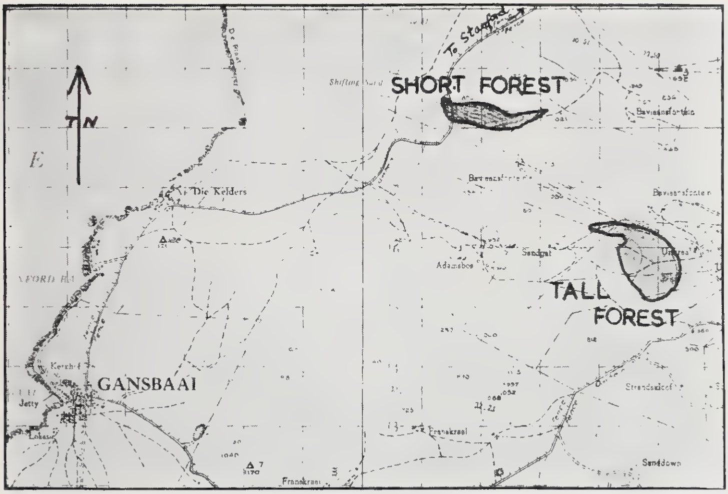

FIGURE 1: Locality map of the area. The positions of Short and Tall Forest have been roughly sketched in.

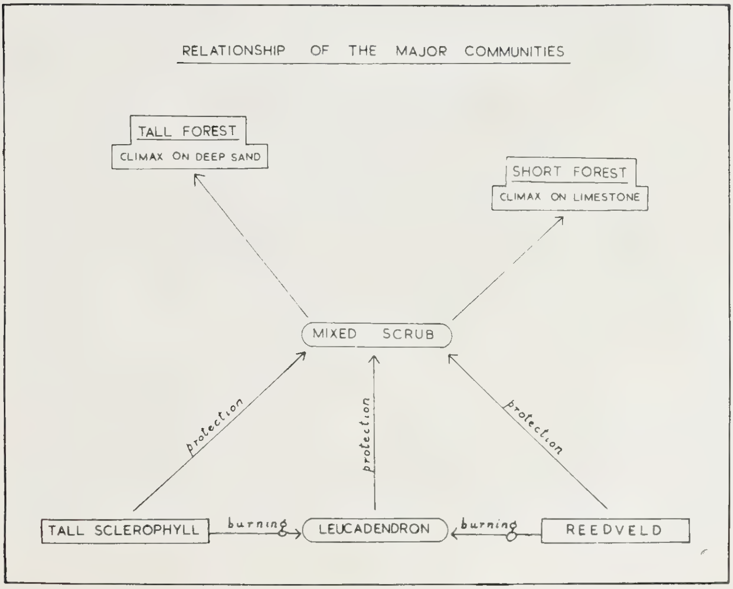

FIGURE 2: Diagrammatic relationship of the major communities.